REMARKS

As a preliminary matter, Applicant's representative would like to thank the Examiner for courtesies extended in the telephone interview conducted on April 26, 2005, in which the rejection under 35 U.S.C. § 112, second paragraph was discussed. Applicant has summarized the substance of the telephone interview below.

Claims 1-26 are all the claims presently pending in the application.

Claims 1-13 have been withdrawn as being directed to a non-elected species of the invention.

Claims 1-7, 11-18, 20, and 24-26 have been amended merely to make editorial amendments to the claims in conformance with U.S. Patent practice, and **not** for overcoming the rejection under 35 U.S.C. § 112, second paragraph, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 14-26 stand rejected upon informalities (e.g., 35 U.S.C. § 112, second paragraph).

These rejections are respectfully traversed in the following discussion.

I. STATEMENT OF THE SUBSTANCE OF THE TELEPHONE INTERVIEW

In the telephone interview conducted on April 26, 2005, the rejection under 35 U.S.C. § 112, second paragraph, was discussed.

Particularly, the Examiner clarified the inquiries set forth in the Office Action with respect to the work function of the first metal of the alloy.

Applicant's representative noted that the term "*work function*" is directed to the first metal. That is, as set forth below with reference to the specification, the first metal is selected based on its work function (e.g., the work function of the first metal as shown in Table 2 of the present application) to form the alloy with the second metal.

The Examiner kindly requested that Applicant provide an explanation to clarify this feature of the claim in the response to the Office Action.

For the Examiner's convenience and to ensure that Applicant properly has responded to the rejection under 35 U.S.C. § 112, Applicant has provided a detailed explanation in response to the § 112 rejection below.

II. THE CLAIMED INVENTION

In an illustrative, non-limiting aspect of the invention, as defined for example, by independent claim 1, an organic semiconductor device including an organic semiconductor layer with carrier mobility deposited between a pair of electrodes facing each other. At least one of the electrodes includes an alloy layer in contact with the organic semiconductor layer. The alloy layer includes a first metal including a work function close to or substantially equal to an ionized potential of the organic semiconductor layer. The second metal includes a lower resistivity than the first metal.

In an organic semiconductor device according to the exemplary aspects of the claimed invention, an electrode having a function of carrier mobility is configured to have an alloy layer including a first metal including a work function close or equal to an ionized potential of the organic semiconductor, and a second metal including at least one different feature from the first metal in terms of adhesion, etching feature, and low resistance. Accordingly, an electron is injected into the organic semiconductor through

the first metal having low barrier feature, thereby achieving an excellent electrical characteristic similar to the case including an elemental metal layer of the first metal. Furthermore, an organic semiconductor is achieving at least one different feature in terms of adhesion, etching feature, and low resistance, as compared with a case utilizing an electrode formed by an elemental metal layer of the first metal. As a result, diversity of material combination for the electrode can be improved (e.g., see specification at page 42, lines 23-27, and page 43, lines 1-12).

III. THE 35 U.S.C. §.S.C. §112, SECOND PARAGRAPH REJECTION

Claims 14-26 stand rejected under 35 U.S.C. §112, second paragraph.

Specifically, the Examiner alleges that "*it is not clear what is meant by the work function of the first metal of the alloy layer. Examiner understands "alloy," (sic) to mean a mixture of two or more metals rather than a layered or laminated set of distinct layers. How would one measure (or calculate) the work function of the first metal in a mixture? Is this the work function of the first metal, as determined by a homogeneous layer of the metal (a layer having only that material)? Or does one determine the work function of the alloy layer (or the mixture layer) and then somehow separate out some part of that work function and attribute that part of the work function to the first metal? In other words, in a mixture of, say, aluminum and gold, the work function of the mixture is not simply a sum of the work functions of pure aluminum and of pure gold. So if the claim intends to specify a contribution of the first metal to the work function of the alloy layer, it is not clear how that work function would be determined. (The specification seems to imply that this is indeed the intention, and the specification could simply be using the term to have its usual meaning.)*" (see Office Action at page 2; emphasis added).

As mentioned above, for the Examiner's convenience and to ensure that Applicant properly has responded to the rejection under 35 U.S.C. § 112, Applicant provides the following detailed explanation in response to the § 112 rejection below.

In response to the rejection under 35 U.S.C. § 112, second paragraph, and the Examiner's inquiries, Applicant respectfully submits that claims 14-26 are clear and definite. Therefore, Applicant respectfully traverses this rejection.

As mentioned above, the Examiner states that "*it is not clear what is meant by the work function of the first metal of the alloy layer*" (see Office Action at page 2; emphasis added).

Applicant notes that claim 14 recites, *inter alia*, that "*the alloy layer includes a first metal including a work function at least one of close to and substantially equal to an ionized potential of the organic semiconductor layer, and a second metal including lower resistivity than the first metal*" (emphasis added).

That is, the alloy includes a first metal and a second metal. The first metal includes a work function close to or substantially equal to an ionized potential of the organic semiconductor layer. On the other hand, the second metal includes a lower resistivity than the first metal.

Thus, Applicant notes that the work function describes the "*first metal*", not the "*alloy*" including the "*first metal*".

Turning to the ordinary meaning of language of the claims, the term "*work function*" is defined as "*the minimum amount of energy required to remove an electron from the surface of a metal*" by The American Heritage® Dictionary of the English Language: Fourth Edition (© 2000). Similarly, the term "*work function*" is defined as "*the minimum energy that must be supplied to remove an electron so that it can just exist*

outside a material under vacuum conditions. The energy can be supplied by heating the material (thermionic work function) or by illuminating it with radiation of sufficiently high energy" by the Chambers Dictionary of Science and Technology, Chambers Harrap Publishers Ltd. (© 1999).

Turning to the disclosure of the present application, the term "*work function*" is used in a manner which is consistent with the ordinary meaning of the term (i.e., the term "*work function*" is not defined as being contrary to the ordinary meaning of the term). Therefore, the term "*work function*" should be given its ordinary meaning by the Examiner.

The specification describes that a "*metal having a work function that is substantially the same as the ionized potential of the organic thin-film having the carrier transporting property is selected for the first metal of the alloy layer that is in contact with the organic semiconductor layer. This is because application of a voltage is necessary for carrier mobility to reduce an energy difference that is caused by the energy barrier between materials that are in contact with each other. Specifically, a low energy barrier is preferable for the carrier to move therethrough without suffering resistance*" (see specification at page 32, lines 16-25; emphasis added).

The specification further describes an example of material having a higher work function, which is used for the first metal in the organic transistor according to the embodiment, is a metal such as gold with a work function over 4.51eV, platinum, palladium, selenium or nickel (e.g., see specification at page 32, lines 26-27, and page 33, lines 1-2).

Moreover the specification describes that, an example of material having a lower work function, which is used for the first metal, is a metal such as silver with a work

function of 4.51eV or under, plumbum, stannum, aluminum, calcium, indium, chromium, alkali metal such as lithium, alkali-earth metal such as magnesium, or the like. Indeed, the specification clearly states, for example, that "*[m]aterials shown in the aforementioned Table 2 may be used*" (see specification at page 33, lines 3-8; emphasis added; see also Table 2).

The specification further states that the work function of the material included in the first metal is preferably within a range of +/-1eV, and more preferably within a range of +/-0.5eV with a center of the range corresponding to the ionized potential of the organic semiconductor to be utilized, as exemplarily defined by dependent claims 15 and 16.

The Examiner states that the "*Examiner understands "alloy," to mean a mixture of two or more metals rather than a layered or laminated set of distinct layers. How would one measure (or calculate) the work function of the first metal in a mixture?*" (see Office Action at page 2).

Applicant respectfully notes, however, that the language of claim 14 clearly does not recite that the "*alloy*" has a "*work function*", but instead, recites that "*the alloy layer includes a first metal*" and that the "*first metal*" includes "*a work function*" (see claim 14).

The Examiner also inquires "*[i]s this the work function of the first metal, as determined by a homogeneous layer of the metal (a layer having only that material)? Or does one determine the work function of the alloy layer (or the mixture layer) and then somehow separate out some part of that work function and attribute that part of the work function to the first metal? In other words, in a mixture of, say, aluminum and gold, the work function of the mixture is not simply a sum of the work functions of pure aluminum*

and of pure gold. So if the claim intends to specify a contribution of the first metal to the work function of the alloy layer, it is not clear how that work function would be determined" (see Office Action at page 2).

In the telephone interview conducted on April 26, 2005, the Examiner explained that the confusion relates to whether the "*work function*" of the first metal is determined or calculated after the mixture or alloy is formed, or if the work function relates to the metal in its pure form.

Applicant respectfully notes that claim 14 is directed to an organic semiconductor device including "*an organic semiconductor layer..., wherein at least one of the electrodes includes an alloy layer in contact with the organic semiconductor layer, the alloy layer includes a first metal including a work function at least one of close to and substantially equal to an ionized potential of the organic semiconductor layer, and a second metal including lower resistivity than the first metal*" (emphasis added).

As mentioned above, Applicant submits that claim 14 clearly and particularly recites that the "*alloy*" includes a "*first metal*" and a "*second metal*", and also that the "*first metal*" includes "*a work function at least one of close to and substantially equal to an ionized potential of the organic semiconductor layer*" (emphasis added).

As mentioned above, the specification describes that a "*metal having a work function that is substantially the same as the ionized potential of the organic thin-film having the carrier transporting property is selected for the first metal of the alloy layer that is in contact with the organic semiconductor layer*", for example, from Table 2 of the present application (see specification at page 32, lines 16-25; emphasis added).

Thus, the work function relates to the work function of the first metal, not to the work function of the alloy.

For the foregoing reasons, Applicant respectfully submits that the ordinarily skilled artisan clearly would know and understand the metes and bounds of an "*alloy layer*" including "*a first metal including a work function at least one of close to and substantially equal to an ionized potential of the organic semiconductor layer, and a second metal including lower resistivity than the first metal*" as recited in independent claim 14 (emphasis added), after a thorough reading of the specification and claims with reference to the drawings of the present application.

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the § 112, second paragraph, rejection.

IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 14-26 are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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